DOCUMENT RESUME

ED 180 682 RC 011 676

AUTHOR Deaton, Don
TITLE Basic Principles--Outdoor Living Skills Series. Instructor Manual.
INSTITUTION Missouri Dept. of Conservation, Jefferson City.
PUB DATE 79
NOTE 40p.

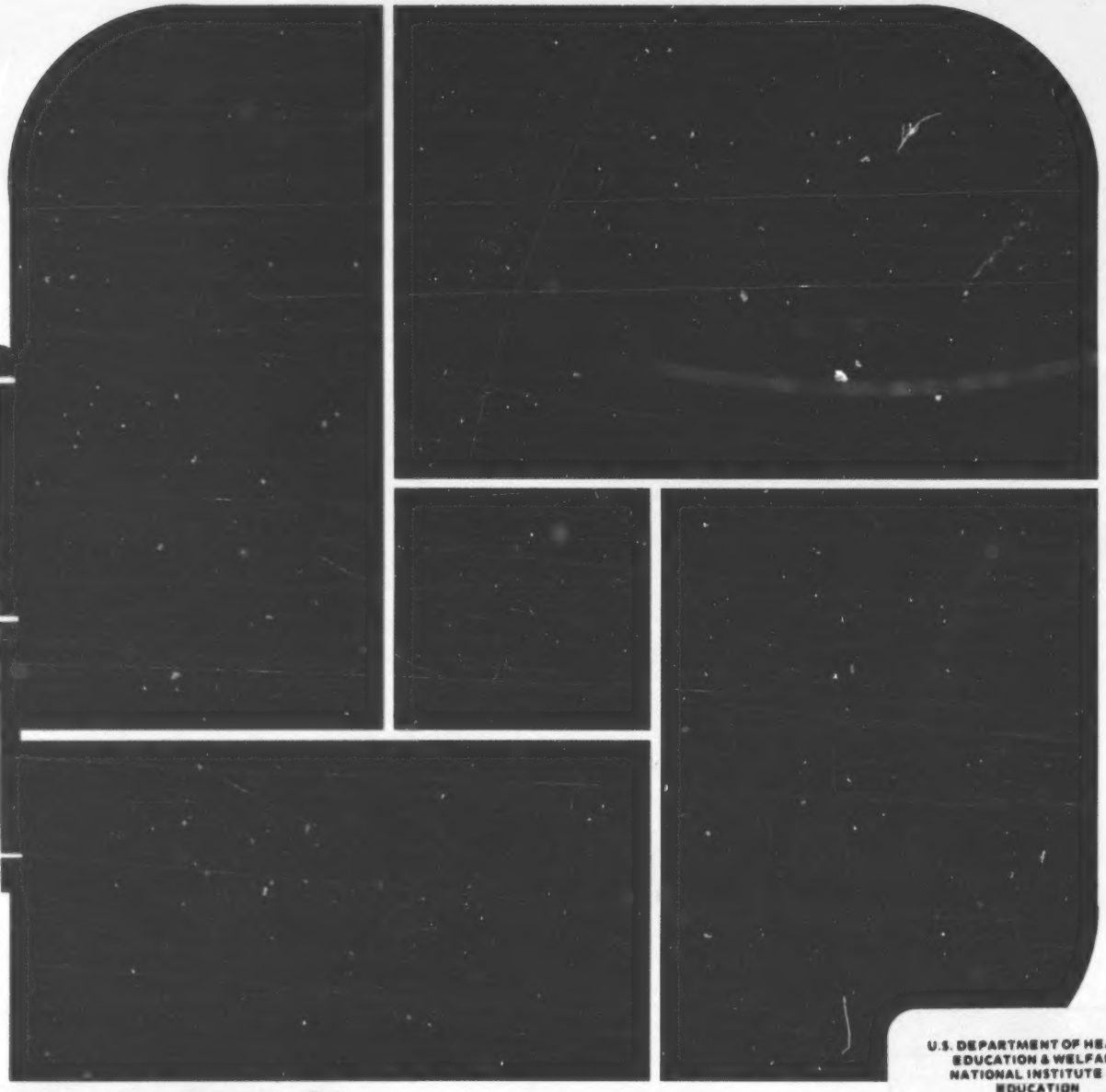
EDRS PRICE MF01/PC02 Plus Postage.
DESCRIPTORS Accident Prevention; Conservation (Environment); Experiential Learning; Food; Learning Activities; *Lesson Plans; *Outdoor Education; Recreational Activities; *Safety Education; *Secondary Education; Skill Development; *Teaching Guides
IDENTIFIERS Air; Missouri; Shelter; *Survival Skills; Water

ABSTRACT

The priorities for sustaining life--air, shelter, water, and food--are the subjects of this module designed to give junior and senior high school students the foundation for safe, rewarding experiences in the outdoors. Five 50-minute lesson plans cover the basic need in order of priority: air (3 minutes to survive without it), shelter (3 hours, in extreme conditions), water (3 days), and food (3 weeks). The module contains background information for teachers, outlines for class lectures, lists of materials for each lesson, and learning activities for students. The first lesson provides an overview of outdoor recreation and the ethics of protecting the environment as well as information on the need for air. Two lessons on shelter discuss ways to avoid hypothermia and hyperthermia and outline the effects on body temperature of radiation, convection, evaporation, respiration, and conduction. The lesson on water covers dehydration, control of water loss, and water purification; students try five methods of purifying water. The lesson on food stresses planning caloric intake for outdoor activities. Some information is specific to outdoor conditions in Missouri; a directory of resource people in Missouri's outdoor skills and conservation education programs is provided. A glossary, a wind chill chart, clothing lists, and a bibliography are included. (JH)

****
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
****

ED180682



U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
NATIONAL INSTITUTE OF EDUCATION

THIS DOCUMENT HAS BEEN REPRODUCED EXACTLY AS RECEIVED FROM THE PERSON OR ORGANIZATION ORIGINATING IT. POINTS OF VIEW OR OPINIONS STATED DO NOT NECESSARILY REPRESENT OFFICIAL NATIONAL INSTITUTE OF EDUCATION POSITION OR POLICY

"PERMISSION TO REPRODUCE THIS MATERIAL HAS BEEN GRANTED BY

Cheryl
Riley Powell

TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)."

BASIC PRINCIPLES

OUTDOOR LIVING SKILLS SERIES

KC 011676

A PROGRAM OF THE MISSOURI DEPARTMENT OF CONSERVATION

OUTDOOR SKILLS EDUCATION MODULES

Missouri's natural resources belong to all its citizens. More and more people are going outdoors to hunt, fish, boat, hike, camp, explore, and learn about nature. The skills they use in the outdoors can have a direct effect on resources. That's why it is important to educate youth and adults in how to use the outdoors wisely and responsibly through schools, community groups, and agencies.

The Outdoor Skills Education Unit of the Department of Conservation, in cooperation with the Department of Elementary and Secondary Education, is developing educational programs to teach Missourians how to use wisely and skillfully the state's many resources for outdoor recreation. The materials, presented as modules, can be used individually or combined in a series by schools, camps, clubs, scouting groups, and other youth or adult organizations. Topics include the shooting sports, casting and angling, trapping, archery, backpacking, camping, aquatics, map and compass, and other skill areas.

Each module is a self-contained unit that includes information on the subject, lesson plans, activities, class exercises, tests, suggested visual aids, and references. Experienced instructors who have taught the subjects and successfully used the activities have written the modules.

For additional information on conservation and outdoor education programs, write the Education Section, Missouri Department of Conservation, P.O. Box 180, Jefferson City, MO 65102.

A Design for Conservation program funded by the ⅛ of 1% Conservation Sales Tax, Amendment No. 1, passed in 1976.

INSTRUCTOR MANUAL

BASIC PRINCIPLES

OUTDOOR LIVING SKILLS SERIES

MISSOURI DEPARTMENT OF CONSERVATION
EDUCATION SECTION

By Don Deaton, Ph.D.
Edited by Cheryl Riley Powell
Illustrated by Les Chubick

For information, contact:
Outdoor Skills--Education Section
Missouri Department of Conservation
P.O. Box 180
Jefferson City, MO 65102
314/751-4115

© 1979 MISSOURI CONSERVATION COMMISSION

About the author

Don Deaton teaches physical education, recreation, and outdoor adventure sports at Missouri Western State College in St. Joseph, Missouri. In addition, he serves as Missouri Western's Coordinator of Physical Education. He is chairperson-elect of the Outdoor Education Recreation Section of the Missouri Association of Health, Physical Education, and Recreation for 1979.

A native of Oklahoma, Don holds a B.S. in Education from Northeastern Oklahoma State University; an M.S. in Health, Physical Education, and Recreation from Colorado State University; and a Ph.D. from the University of Utah. For several years Don has been teaching teachers and students how to safely enjoy the primitive outdoors. When time permits, he himself is off to a wilderness area to hike, fish, camp, and climb. His Basic Principles material has been used successfully in Missouri schools.

How to use this module

This module has been produced for you who teach, or in some way work with, junior and senior high school youth. The material has been written with the classroom teacher in mind, but it also can be adapted by leaders of camps, 4-H clubs, scouting organizations, and other youth groups. A variety of information and activities has been included to make the module useful to as many groups as possible. Each module may be used individually or combined with other modules for a more extensive course.

The Basic Principles module contains:

Introductory Information--Questions such as "Why teach this subject?" are answered, and goals and objectives approved by the Missouri Department of Elementary and Secondary Education are included. A brief history of the subject is given as background.

Ethics--This module addresses what should be the ethical concerns and responsibilities of individuals who use Missouri's natural resources for outdoor recreation.

Subject Information--This section provides the information you need to teach students how to satisfy their basic needs for air, shelter, water, and food in the outdoors.

Lesson Plans--Field-tested methods of teaching this material are provided in four lesson plans. The time for each lesson is only suggested and will vary from instructor to instructor. All equipment and materials you will need for the activities are listed. Materials can be borrowed or brought from home, so you should not need to purchase any equipment.

Student Handouts--Included as appendixes are a wind chill chart, a minimum outdoor clothing list, and a hidden word puzzle. These are designed so you can reproduce them for your students.

Suggested written test--If you are a classroom teacher and want to evaluate your students' mastery of the material you have been teaching, a sample written examination is included. Test questions are keyed directly to the objectives for the module. Answers also are provided.

Glossary and Bibliography--These are provided as additional information which may help you in teaching the subject in more detail.

Outdoor Skills Education Specialists are assigned to seven regions throughout the state. They will assist you in obtaining materials and scheduling equipment and films that are available from the Department of Conservation. They also offer workshops to provide training and certification in several outdoor skills. Check the last page of this module for names, addresses, and regions.

The Missouri Department of Conservation

COMMISSIONERS	W. Robert Aylward J. Ernest Dunn, Jr. G. Andy Runge
DIRECTORS	Larry R. Gale, Director Allen Brohn, Assistant Director Osal Capps, Assistant Director Mike C. Milonski, Assistant Director Charles Purkett, Assistant Director
EDUCATION	Clarence E. Billings, Superintendent of Education Patti Daley, Secretary
OUTDOOR SKILLS EDUCATION	F. E. "Bud" Eyman, Assistant Superintendent Cheryl Riley Powell, Projects Coordinator Barbara Brandes, Secretary Martha Green, Secretary Louis F. Diebold, Savannah Richard Flint, Aurora Betty A. Loggins, Kansas City Wayne Martin, Kirksville William D. Rice, Kinloch Robert D. Staton, Jr., California Stephen J. Wilson, Cape Girardeau
CONSERVATION EDUCATION	Gary D. Harvey, Assistant Superintendent Carol Penry, Projects Coordinator Freida Fisher, Secretary Ross Allen, Springfield Larry Behrens, Shelbina Hollis D. Crawford, Gibbs Virgil L. Davis, Houston Rodney J. Green, Albany Gordon S. Griffin, Charleston Wendell Jeffery, Eldon Neil W. Jenkins, Lee's Summit Charles D. Jordan, Knob Noster David B. Knisley, Fenton Al Palladino, Warrenton Jim Pyland, Kearney Harold W. Thiele, St. Louis Jack C. Woodhead, Eureka

Questionnaire

Please help us evaluate the effectiveness and use of our materials by completing the following questionnaire and mailing it to the Missouri Department of Conservation, Outdoor Skills Education, P.O. Box 180, Jefferson City, MO 65102.

How did you obtain a copy of this module?
Have you used this material? Why or Why not?

_____

_____

Your position

_____

Age group you teach

_____

CONTENT AND FORMAT

Were you given enough information to teach this course?

Enough _____ Not Enough _____ Too Much _____

Comments: _____

_____

Was material presented in a manner easy for you to use?

Yes _____ No _____

Comments: _____

What information would you add or subtract?

_____

_____

_____

LESSON PLANS AND ACTIVITIES

Did you use the lesson plans?
Were the time periods allowed for activities adequate?

All of them _____ Some of them _____ None of them _____

Adequate _____ Too much time _____ Not enough time _____

Comments: _____

_____

Which activities did students most enjoy?
What additional activities would you include?
What suggestions do you have for future modules?
What topics would you like to see covered?

_____

_____

_____

_____

_____

Contents

3	About the author
3	How to use this module
4	The Missouri Department of Conservation
5	Questionnaire
8	Review Committee
9	**INTRODUCTION**
9	Goal and purpose of the module
10	Content of the module
10	Objectives
10	Brief History
11	**ETHICS**
12	**PRIORITIES FOR LIFE**
12	Air
12	Shelter
15	Water
17	Food
20	**LESSON PLANS**
20	No. 1
22	No. 2
26	No. 3
27	No. 4
29	**RELATED ACTIVITY**
30	**GLOSSARY**
31	**BIBLIOGRAPHY**
32	**APPENDIXES**
32	Appendix 1--Wind Chill Chart
33	Appendix 2--Minimum Outdoor Clothing Lists
34	Appendix 3--Hidden Word Puzzle
35	Instructor's Key to Hidden Word Puzzle
36	Appendix 4--Suggested Written Examination
37	Specialists' Regions
38	Consultants' Regions

Review Committee

The material in this module has been reviewed by the following people:

Claudia Hunter
Outdoor Education Instructor
Lee's Summit High School
Lee's Summit, MO

James Kloepper
Director
Bound to Win--Adventure Project
Louisburg, KS

Michael McIntosh
Publications Editor
Missouri Department of Conservation
Jefferson City, MO

Robert M. Taylor, Ph.D.
Director of Health, Physical Education, and Recreation
Missouri Department of Elementary and Secondary Education
Jefferson City, MO

Joel Vance
Information Specialist
Missouri Department of Conservation
Jefferson City, MO

Introduction

Goal of the module

To prepare one to live successfully within nature's rules while in the outdoors.

Purpose of the module

Americans are participating in outdoor recreational activities in ever-increasing numbers (see chart at left). Many who want to share the joys of a wholesome outdoor experience will have that joy turn into anxiety, anguish, or in some cases, tragic death. Why? Unfortunately, they are unprepared to cope with environmental conditions because they are misinformed about, or simply do not know, the adaptations they must make to safely enjoy an outdoor experience.

As a society we have evolved from a hardy pioneer stock who hunted and fished almost daily for needed food to a nation of urban dwellers. Demographers project that by the year 2000, 90 percent of our population will live in urban areas. Most of our citizens are not used to extended exposure to the elements in a non-urban setting such as a wilderness area, wild river system, or national or state park backcountry; yet millions are flocking to taste the "wilderness experience."

Occasional weekend outings to hunt pheasant, fish for bass, or camp on a gravel bar may not be well planned. People who live a sedentary, indoor life all week and then suddenly exert themselves in the outdoors need to understand certain basic principles that apply in all kinds of weather. They need to know how to fulfill their basic needs for air, shelter, water, and food when they go into the outdoors.

A person residing in Missouri faces the prospect of a multi-variant climate. Missourians experience hot, humid summers and biting winters, sometimes with considerable snow. On a winter day temperatures may vary 60 degrees or more from one part of the state to another. The wind chill factor can change the effect of the temperature even more (see wind chill chart, Appendix 1). Recent winters are an excellent example of weather instability with large snowfalls in areas of the state that usually receive little accumulation. A snowstorm in 1979 dumped 24 inches of snow on southeast Missouri and immobilized the area. Motorists were stranded for hours, even days, before they were able to move their cars. Therefore, people traveling, residing, or those involved in outdoor activities in Missouri should be prepared for any type of weather.

People usually associate extremes in weather with mountainous states. They are more aware of the potential dangers when traveling or residing in those states. Yet most midwestern states also face unpredictable weather. The potential for disaster in Missouri is no less real than in any other state; and because the weather is inconsistent and unpredictable, there may be more danger if people go outdoors unprepared.

Certain basic principles should be a part of the planning for any outdoor pursuit whether it is a hunting trip, a river float, whitewater canoeing, an extended backpacking trip, fishing, hiking, boating, climbing, or another activity. Anyone venturing into the natural environment, even for a short stay, should be aware of potential consequences and know what's necessary for a safe encounter with nature. Too many deaths are a direct result of ignorance or misinformation. Even one death is unnecessary.

As instructors in outdoor education, you need to insure that your

The U.S. Department of Interior estimates that the following number of people, 12 years of age or older, participate in these activities five or more times a year.

Activity	*Millions Participating*
Walking or jogging	*96.7*
Picnicking	*84.0*
Pool swimming, sunning	*83.5*
Bicycling	*66.1*
Fishing	*61.9*
Nature walking	*61.9*
Beach swimming, sunning	*59.5*
Tennis	*40.9*
Boating	*34.3*
Riding off-road vehicles	*33.8*
Hiking or backpacking	*28.1*
Hunting	*24.5*
Developed-site camping	*21.0*
Sledding	*20.8*
Golfing	*18.9*
Ice skating	*15.7*
Primitive-site camping	*15.0*
Horseback riding	*13.5*
Water-skiing	*13.1*
Canoeing or kayaking	*9.0*
Snowmobiling	*7.8*
Sailing	*7.8*
Downhill skiing	*7.3*
Cross-country skiing	*2.0*

Teaching the basic principles will help guarantee that your students have a safe and enjoyable outdoor experience.

students will have a safe, positive, and rewarding encounter with nature. If you understand certain basic principles and teach them to your students before you begin outdoor activities, you will help guarantee that they have an enjoyable first experience they will want to repeat.

Content of the module

The best way to prepare for an outdoor experience is to understand the priorities for sustaining life. Those priorities--air, shelter, water, and food--are discussed in this module. Needs of the body in relation to these priorities are examined for different outdoor environments and conditions.

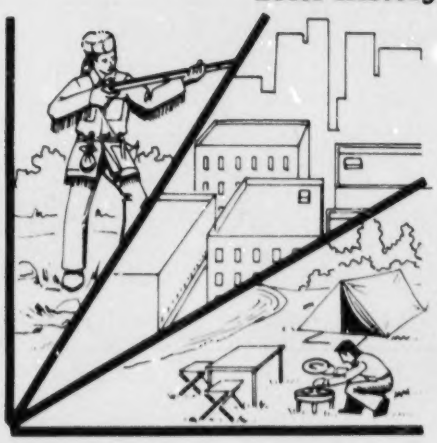
Included in this module with the subject information are lesson plans for five 50-minute classes, a glossary, four appendixes (wind chill chart, clothing lists, hidden word puzzle, written exam), and a bibliography. Three films are suggested as teaching aids. Equipment for class activities should be easy to acquire. It is recommended that the Basic Principles module be taught before other outdoor skills courses.

Objectives

At the completion of the instruction, the student should be able to do the following:

1. List, in the proper order, the four priorities and for each give the time it might take for death to occur if the priority were denied.
2. List and briefly describe the five means by which body heat is lost or retained.
3. Describe the layering principle of dressing for outdoor activities and list the six layers of clothes necessary to retain body heat in winter.
4. Identify wool as being the best material to wear in the outdoors in winter and give one reason why it is the best.
5. List and describe at least two methods of purifying water and name which method is recommended as being the safest.
6. Identify that fats produce the greatest number of calories of energy and list at least five high energy foods.
7. Define basal metabolic rate and describe what part it plays in maintaining caloric balance.
8. List at least three reasons why alcohol is an inefficient source of energy and can be dangerous if consumed in the outdoors.
9. Write a short essay discussing preparations for an overnight winter camping trip in Missouri, and give one or more reasons why each is necessary.

Brief History



Americans historically have been pitted against nature for their livelihood. Many Americans are descendants of those who carved a nation from a wilderness. Our ancestors labored to "civilize" the wilderness they encountered. They directed their efforts toward conquering and taming the wild country which they saw as their enemy.

As the wilderness became more urbanized and cities grew, attitudes began to change. Suddenly, wilderness gained a new, refreshing appeal to many people who were repulsed by the "concrete jungles" of the cities. Protecting wilderness became important; therefore, in 1872 the government established Yellowstone National Park in Wyoming. One of the primary crusaders for preserving wild country was Theodore Roosevelt, 26th President of the United States, who personally led an active campaign to preserve and protect American wilderness. His conservation conscience has been instilled in many Americans.

Today Americans still have wilderness, although not in nearly so vast a quantity as the early pioneers who came to this land. Our attitudes toward the natural environment have changed from a survival psychology to a conservation and preservation psychology. *Preserve, used here, does not mean excluding entry into an area; rather, it means preserving the integrity of a natural area or an experience.)*

Few of us "live off the land" any more. Natural barriers are not nearly as formidable as they once were. We are at the same time removed from the land while it is more accessible to us. To protect natural resources as well as ourselves, we must be responsible for our conduct when we use any natural resources now and in the future.

Ethics

Any person engaging in an outdoor pursuit or entering a natural area should realize an obligation and responsibility to protect and conserve natural resources. Not taking care of resources takes its toll in polluted waters, scarce wildlife, scarred forests, littered campsites, and other damage to both public and private properties.

Outdoor enthusiasts also should take precautions not to become an economic and physical burden on others. Most accidents are caused by carelessness or lack of forethought. Hunters, for example, can become so absorbed in stalking their game that they become disoriented and lost. Rescues and salvage operations are expensive and may threaten the lives of rescuers. Oftentimes, tax dollars are used to pay for rescue personnel and operations.

The United States, and especially Missouri, is fortunate to have relatively vast expanses of wild country. Those who use the forests, lakes, and streams have a responsibility to use them wisely and responsibly in order to preserve similar experiences for future generations.

Priorities for Life

Human beings must satisfy certain basic needs to sustain life. These needs demand more attention when people are exposed to a natural environment instead of an artificial environment controlled by dials and switches.

Our needs have priorities. When we satisfy our needs in the proper order, we're most assured of a safe encounter with nature and an enjoyable outdoor experience. Unfortunately, a great number of people who want to engage in outdoor activities are unaware of the proper order of priorities.

In most cases, death may occur if the following are denied for longer than the given times.

Air - 3 minutes
Shelter - 3 hours (in extreme conditions)
Water - 3 days
Food - 3 weeks

1 Air

Foremost, the body requires air, which contains the vital gas oxygen, to live. In most cases a person will die if air is denied for longer than three or four minutes. Even if death does not occur, the brain probably will be damaged and chances for a normal life will be slim. Thus, breathing becomes our first priority. In most cases this is no problem and can be taken for granted.

Exceptions to this may occur during an excursion into a high altitude area. Higher elevations present a breathing problem to those who do not first become acclimatized to the changes in elevation. Air is thinner at higher altitudes because the pull of gravity is less; and as a result, oxygen is under less pressure. To avoid potentially serious medical problems ranging from dehydration and mountain sickness to pulmonary edema and, in severe cases, death, you should slow your pace and stop frequently to rest and to drink liquids. Be alert to symptoms of nausea, acute shortness of breath, headache, "heavy legs," and muscle cramps. Some people simply cannot adjust to high altitudes and must remain at lower elevations. In any case, ample time should be allowed for acclimatization. Slow, easy travel should be the order of the day.

2 Shelter

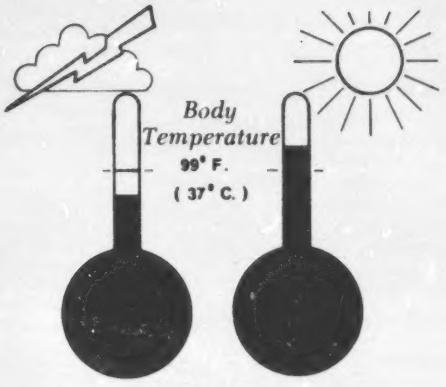
The second priority is shelter for the body. Exposure to harsh and severe climatic conditions without adequate shelter and protection is more threatening to life than doing without water or food. Unfortunately, many people involved in outdoor activities are not aware of the dangers of extreme heat or cold and, therefore, place less importance on shelter than they should.

Shelter for the body begins with clothing. In the outdoors you must dress appropriately for the climatic conditions and environment you expect to encounter. Knowing the area is important for planning. "Expect the best but prepare for the worst" is a good motto to live by in the outdoors.

Body heat is lost through
radiction
convection
evaporation
respiration
conduction

A person can lose or retain body heat through any one or a combination of five physical processes: radiation, convection, evaporation, respiration, conduction. Not controlling body temperature can result in one of two conditions, either of which is a potential killer.

14



Hypothermia *Hyperthermia*

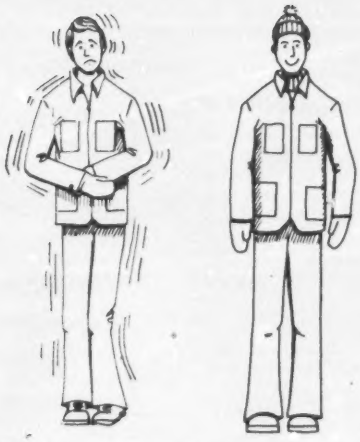
Hyperthermia--increasing of the body's core temperature, a condition related to the effects of heat.

Hypothermia--lowering of the body's core temperature, a condition related to the effects of cold.

Hyperthermia can occur any time a person is directly exposed to the sun's rays for a long period of time or exercises strenuously on a hot day. A hunter sitting still and waiting in the sun or a fisherman in a boat in the middle of the lake may not realize the effect the sun is having. A backpacker climbing with a heavy pack on a hot day also can become a victim of hyperthermia.

Hypothermia is especially dangerous because it can sneak up unexpectedly on a person and may go undetected until it is too late to recover. Hypothermia is most likely to occur when it is cold (temperatures below 60°F/15°C), windy, and wet. (For treatment of these conditions, refer to the Environmental Emergency Preparedness module.)

Clothing yourself to prevent heat loss through any of the five physical processes requires some planning and knowledge of each.



"When your feet get cold, put on your hat."

RADIATION

Your body continually gives off heat; and if the heat is not kept close to your body by your clothing, you can become cold and chill quickly. Up to 75 percent of body heat can be lost (radiate) if the head and neck are unprotected. At the first sign of a shiver, you should cover your head with a suitable hat or cap. A mountaineering proverb says, "When your feet get cold, put on your hat." It works.

To prevent loss of body heat through radiation, follow these clothing principles:

1. Wear loose, lightweight *layers* of dry clothing. Good outdoor clothing retains the body's heat and traps air, which also insulates. *Wool* is still the best fabric for the outdoors because it will continue to insulate and retain body heat even when it's wet. Several thin layers of clothing are more effective than one thick layer, for they can be removed or added as conditions demand.

2. Wear a hat, preferably a wool one, and cover the neck.

3. Avoid constricting circulation by wearing clothes that are too tight. Some people get into trouble by wearing so many pairs of socks that their footwear is too tight. You should be able to wiggle your toes in your shoes or boots.

4. Cover wrists and ankles, for this is where the blood flows near the skin's surface.

5. Know which clothing materials have the best insulating properties for the conditions to be encountered. Goose down retains body heat well and is more lightweight and compact than many materials, but it loses its insulation if it becomes wet. Some of the new polyester substances (e.g., *Hollofil II*, *PolarGuard*, *Thinsulate*) will not absorb water and, therefore, retain their loft and continue to insulate when wet. Tests have shown that *Thinsulate* has a heat retention value nearly twice that of down.

APPLY LAYERS OF CLOTHES.

1st layer: *undergarments*
2nd layer: *shorts and T-shirt*
or
long underwear
1 pair thin wool socks
3rd layer: *1 long-sleeved shirt*
wool pants
1 pair wool socks
wool hat, mittens or gloves, and scarf
4th layer: *wool sweater*
another pair of pants (if needed)
another pair of mittens (if needed)
5th layer: *parka, jacket or windbreaker*
6th layer: *rain suit or poncho (if needed)*

CONVECTION

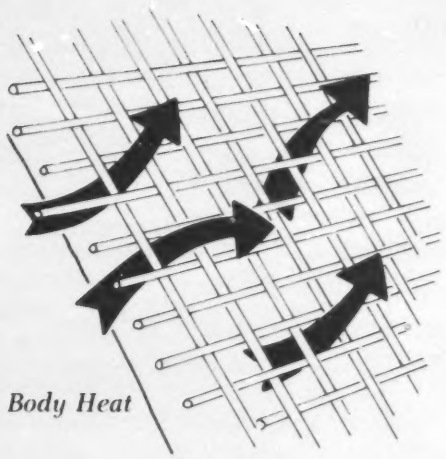
The body warms a thin layer of air next to the skin; but when outside, air moving over the body takes away the warm air, replacing it with colder air that draws away body heat. Even the slightest wind can have strong effects (see wind chill chart, Appendix 1).

Clothing that has an extremely tight weave can provide wind protection and reduce body heat lost by convection. In hot weather, wind can carry away excess body heat and reduce the danger of hyperthermia; thus, clothing with a loose weave is important in summer to allow ventilation.

In colder temperatures, a lightweight outer garment designed specifically for wind protection is essential. It also should resist water because staying dry is critical. Hypothermia can occur very quickly when a person is wet and the outside air is chilly. A fisherman or canoeist who unexpectedly falls into the water or stays out in a shower on a cool, spring day may develop hypothermia.

EVAPORATION

The body perspires even in cold weather, and body moisture can become a serious problem if it's not allowed to evaporate. The key principle to remember is that body moisture *must* be allowed to evaporate and should not be trapped next to the skin.



"Breathability" is important in the selection of any garment. Usually a garment that protects against rain or snow will not allow moisture to escape. Garments made for wind protection usually are breathable, but they may not be waterproof, which also can create problems. Some wind garments are water-repellent, but if they are subjected to continuous moisture, they ultimately will become soaked.

Fortunately, modern technology is producing materials which will provide both wind and water protection and still allow body moisture to dissipate. (One such material is *Gore-Tex*.) Wool also has the valuable attribute of drying from the inside out, thus carrying moisture (wicking) away from the skin.

In cold temperatures it's a good rule of thumb to try to keep physical exertion below the point at which you begin to perspire, for wet clothing will increase heat loss. If you do plan to exercise strenuously, it's important to have on light insulation, to remove layers of clothes, and to wear garments that have zippers (under the arms, at the neck and wrists, and down the front).

RESPIRATION

When you breathe, you inhale the temperature of the outside air and exhale warm air. In cold weather this contributes to the loss of body heat. In extreme cold, warming the air before it enters the body may be necessary and can be achieved by covering the mouth and nose with a wool scarf or cloth. This porous, protective covering retains some heat.

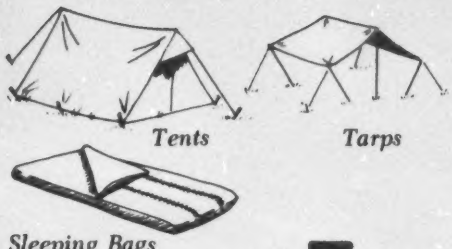
Warm the air you breathe.

CONDUCTION

Contact with cold surfaces draws or conducts heat away from the body. The colder the surface you are touching, the more heat loss that will occur. Allowing skin to touch cold metal such as gun barrels, tent stakes, and cameras can quickly cause frostbite. Direct contact with the snow, for example, can cause loss of body heat and also make clothing wet, which increases chances for hypothermia.

Clothing that insulates body heat will help reduce conduction. Other materials may help too. Tarps, gloves, pads, or cushions provide insulation from cold surfaces.

Clothing is the primary shelter for the body, but tents, tarps, snow caves, igloos, sleeping bags, and other shelters provide additional protection from the natural elements such as sun, rain, wind, and snow



Tents *Tarps*

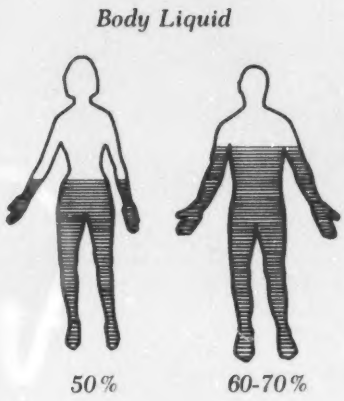
Sleeping Bags

which could threaten your life. (For more specific information on these shelters, refer to the Environmental Emergency Preparedness module and the Backpacking module.)

A basic principle to remember is that unprotected exposure to extremes of heat or cold, along with the complications of moisture and wind, can cause death in a short period of time.

3 Water

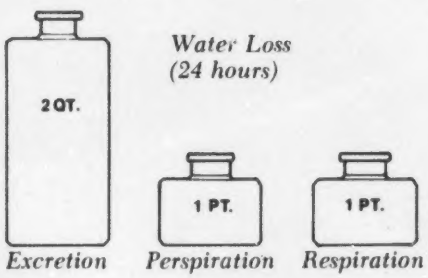
The third priority for sustaining life is water. In most situations a person can expect to live about three days without water, although circumstances can reduce or extend this period. An example is a young boy in Rumania who was buried by rubble from an earthquake and survived without water for 11 days. He probably lived because he was immobilized and his water expenditure was at an absolute minimum. His story illustrates the importance of conserving energy and minimizing movement to reduce water expenditure.



A substantial portion of the human body is composed of water. The amount varies according to the individual. Male body composition is 60 to 70 percent water; therefore, if a man weighs 150 pounds, as much as 100 pounds of his weight may be water. Women usually have a higher percentage of body fat, and their body composition may be only 50 percent water.

Water is crucial to body functions. Blood is predominantly water. Every cell in the body also contains water, and water is used to transport body waste.

Control of water loss is critical in both hot and cold weather. While people are aware of the need for water in hot climates, their awareness and concern seems to decrease with the temperature; yet dehydration also is a common danger to those exposed to a cold environment. Mountaineers must be acutely aware of maintaining an adequate water supply.



Maintaining a balance between water loss and water intake is especially important to anyone going on an outdoor excursion. Under normal conditions, a person loses about 2½ quarts of water per day--two quarts from excretions, one pint from perspiration, and one pint from respiration. (Water is lost when you exhale--a good example is the moisture on the inside of the tent when you wake up in the morning.) Most of this water loss is replaced by drinking and eating. In the outdoors, both weather conditions and physical exertion can increase water loss.

Dehydration, an abnormal depletion of body fluids, can impair health and cause death. Even a 3 percent water loss that is not replaced can cause a 25 percent decrease in efficiency and the ability to make rational decisions. A 10 percent water loss usually will mean death if water is not replaced.

Water loss can be minimized by following certain principles:

1. Stay in the shade or away from direct exposure to heat.
2. Reduce activity to an absolute minimum.
3. Keep your mouth closed.
4. Wear clothing that retains perspiration if it's appropriate for the conditions and the weather.
5. Ration sweat, not water. Rationing water is a misconception that could be fatal. Trying not to perspire too much will help more than drinking small, occasional sips of water. For example, a person with a

Ration sweat, not water.

gallon of water who is exposed to 110°F(43°C) in the shade can expect to live four days, only one more day than if he had no water at all.

When planning an outdoor excursion, you *must* arrange to have water and to replenish that water supply. If you cannot carry all the water you'll need, you may want to consider purifying available water. If there is the slightest doubt about the purity of the water, purify it! In the 1940s a group of hunters in northern Missouri stopped at an abandoned farm and drank from the well at the house. Two members of the group died after drinking the water. Another man became extremely ill and lost all his hair. Any water source close to human or livestock habitation should be suspect; and if the habitation is above the flow of water, you need to purify the water.

PURIFYING WATER

Editor's Note: Water found in the outdoors may not be safe to drink. As more and more water becomes polluted, it's important to know how to purify water to make it safe to drink. All water should be suspect. Cold, fast-flowing water is not automatically safe to drink; nor is cold weather a protection against intestinal parasites. Springs in Missouri also may be contaminated. The only way to be certain that the water you are drinking is safe is to take enough water with you or purify the water you find. Various purification methods exist and some that have been relied upon in the past have been proven not to be effective in killing all pollutants, which include bacteria, viruses, amoebic cysts, and slimes. An article in Wilderness Camping *[C.B. McCartan, "Son of Iodine, Out of Halazone," Wilderness Camping, (December/January 1979): 56-73], reviewed the various methods in light of the most recent research. McCartan recommends that the best way to guard against all pollutants is to disinfect the water with iodine and then filter it using a commercial filter system.*

Several purification methods are summarized here.

IODINE

Iodination destroys amoebas, their cysts, bacteria, algae, spores, viruses, or whatever. Iodine can be used by adding four drops of 2-percent tincture of iodine to a quart or liter of clear water or eight drops to a quart or liter of cloudy water and letting it stand for 30 minutes.

Iodine crystals also can be used for iodination. Pour five grams of USP grade resublimed iodine crystals (available from a druggist) into a one ounce clear glass bottle that has a tight-fitting lid. Fill the bottle with water, cap it, and shake it vigorously for a minute. Turn the bottle upright and allow crystals to settle. This makes a solution that can be used for disinfection. *You should not use the crystals directly; only use the solution.* The temperature of the water affects the rate of disinfection. If the water is 75°F (24°C), add five capfuls and wait 15 minutes. If the water is about 32°F (0°C), wait 30 minutes or add eight capfuls. Water that is 104°F (40°C) needs only four capfuls per quart or liter.

The toxicity of iodine is very low when used in these recommended concentrations. However, use of iodine should be restricted to vacation use or during an emergency.

Flavoring may be added to water treated with iodine to kill any bad tastes, but no flavoring should be added until the appropriate time period has elapsed.

CHLORINE BLEACH

Household laundry bleaches such as *Clorox* or *Purex* can be used by adding two drops to each quart or liter of clear water or four drops to each quart or liter of cloudy water. Let the water stand for 30 minutes. Chlorination, however, is unpredictable and may be useless when water is contaminated with organic material.

WATER PURIFICATION TABLETS

Tablets that release chlorine or iodine into the water (*Halazone* or *Potable Aqua*) are available commercially, but their effectiveness is questionable because the tablets deteriorate with time, temperature, and exposure to air. Tablets should not be relied upon unless they are fresh, and they should not be used to treat heavily polluted water.

BOILING

Many government agencies recommend boiling as the best method. Water should be brought to a rolling boil for at least five minutes. For each 1,000 feet (305 meters) you are above sea level, add an additional minute to the boiling time. Boiled water tastes flat, and can be improved by pouring it back and forth into an empty container.

TREATMENT EQUIPMENT

This equipment can be costly, but using it to filter water that has been disinfected is the most reliable method of purification. In the article cited earlier, McCartan recommends that a water-purifying unit in conjunction with a filter must be able to:

1. remove harmful bacteria,
2. remove larger cysts not destroyed by disinfecting agents,
3. remove organic chemical pollutants plus color, taste, and smell,
4. remove chlorine and iodine tastes and smells,
5. not breed and/or release harmful bacteria,
6. leave in dissolved minerals essential to health,
7. indicate the end of its useful life.

During cold weather, obtaining water may be more of a problem. Melting ice to get water is preferable to melting snow because ice yields more water with less heat and time. Ice, however, is only as pure as the water before it was frozen. Freezing does not destroy harmful parasites.

When melting snow, use only small, compressed quantities at a time or the pot will burn. If water is available, place a small amount in the bottom of the pot, then gradually add the snow.

Eating ice or snow is not recommended because the mouth can become so swollen and painful that it interferes with eating and drinking. Also, deaths have been attributed to hypothermia brought on by ingesting too much snow or ice.

4 Food

After you have satisfied the first three priorities for sustaining life, you then can turn to food. Food is the fourth priority because most people can live approximately three weeks or longer without eating if they have water and are not active. Food produces energy, however, and that is a primary consideration in planning an outdoor excursion.

When planning menus for the outdoors, you need to consider the weight of the foods, cooking time, water requirements, packaging, cost per serving, and servings per meal. (For more information, refer to the

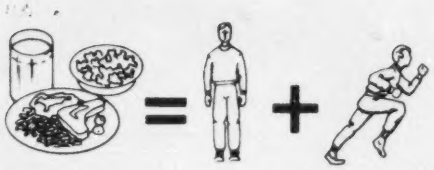
Backpack Cookery module.) In recent years considerable progress has been made in developing lightweight, easy-to-prepare meals for campers. Specialty shops, mail-order houses, and grocery markets now contain a wide assortment of energy-producing meals that are palatable and meet the requirements of the person going on an extended outdoor trek.

Depending on your activity, you can plan outdoor meals similar to your regular meals at home. Special planning usually is required for extended treks such as backpacking, mountaineering and climbing, wilderness canoeing, and some hunting and fishing trips. To properly plan what food should be taken on an outdoor excursion, it is necessary to understand how much energy different foods produce.

Energy is produced in the body from the food we eat. Fuel for the body is stored in different forms and the units of heat are referred to as *calories*. The energy produced by calories is used for a variety of body needs--physical work, maintenance of body temperature, growth of new tissues, organic functions, and maintenance of proper chemical balance within body cells. Energy is transformed (calories used) depending on how quickly it is needed, how strenuously the muscles work, and how long the activity lasts.

When a person is completely at rest and has not eaten for at least 12 hours, energy is being used only to keep internal organs functioning and to maintain body temperature. This process, referred to as the "basal metabolic rate" (BMR), goes on 24 hours a day. For a person to maintain a given weight, energy input (calories) must equal basal energy expenditure *plus* whatever is expended through physical activity. This concept is sometimes referred to as "caloric balance."

Caloric Balance



Calories consumed *BMR* *Energy expended*

A man who is six feet tall and weighs 175 pounds requires about 1800 calories a day to maintain his basal energy needs. His basal rate is influenced by his age, sex, size, and percentage of body fat. Since fat tissue is metabolically much less active than muscle and organ tissue, a muscular person will expend more energy when at rest than a person who weighs the same but has a higher percentage of body fat. Women, who have a higher percentage of body fat, generally have a lower BMR.

Age is an important factor because basal energy expenditure declines significantly with increasing age. Consequently, a person with sizeable energy and food needs during younger years may have rather modest needs later in life. People may become less active as they grow older; and because they often do not compensate for less energy expenditure by reducing their caloric intake, they experience "creeping obesity," a common problem among American adults. Failure to compensate for the decline in physical activity with a reduction in caloric intake can result in accumulating 12 pounds of body fat each year.

High Energy Foods

Foods are used differently by the body. The number of calories in a given food can be determined by the amount of heat produced when that food is burned. A gram of fat produces about nine calories of energy. Each gram of carbohydrate produces about four calories of energy, less than half that of fat. Protein, with only 92 percent absorbed during the digestive process, yields about four calories of effective energy per gram. Alcohol is absorbed completely and each gram produces seven calories of energy, but alcohol dehydrates the body and is an inefficient source of energy. It should be avoided!

1 gram fat = 9 calories of energy

1 gram carbohydrate = 4 calories of energy

1 gram protein = 4 calories of energy

An outdoor trip that will require high energy should include meals

GORP Recipe

1 cup peanuts
1 cup raisins
1 cup M&M *candies*

Mix together and package in individual plastic bags. You can substitute or add cashews, walnuts, shelled sunflower seeds, chopped dates or other dried fruit, and coconut. In winter you can use miniature marshmallows, chocolate, and butterscotch chips.

with generous amounts of fatty foods. Margarine, nuts, peanut butter, and vegetable oils will add concentrated calories without an unnecessary addition of bulk or saturated animal fats.

A good source of energy for active outdoor people is GORP (Good Old Raisins and Peanuts--see recipe at left). It can be carried in the pocket of a jacket or hunting vest and provides quick, efficient energy.

Carbohydrates provide less than half the energy per gram as fats, but they are still a good source of energy. Starches and sweets may contribute a substantial number of readily usable calories because they are made from refined carbohydrate sources like table sugar and highly milled flour. They are concentrated sources of calories, too, because they have minimal water and fiber content. Popular desserts like pies, cakes, and other pastries are usually considered to be carbohydrate foods; but actually they contain large quantities of shortening, which is fat.

Certain vegetables such as celery, lettuce, cabbage, and similar plants contain large amounts of carbohydrates in the form of cellulose, but they provide little energy. Humans cannot digest cellulose, and it only adds bulk to the diet. Because of their high bulk and low caloric content, these plants are inefficient for anyone who has high energy demands. Therefore, someone who is lost may need to conserve energy more than search for food, because any wild plants and berries found will not produce much energy. Valuable energy may be lost in looking for food that has few energy-producing calories. A good rule of thumb is to *conserve energy*.

ALCOHOL — WHY YOU SHOULD ABSTAIN IN THE OUTDOORS

Alcohol is a poor source of energy in any circumstances. It acts as a depressant on the central nervous system, has a dehydrating character, and must be converted into glucose by the liver before its energy can be utilized. Conversion of alcohol to glucose, which takes place only in the liver, is a very slow process. Muscles cannot use alcohol as a direct source of energy. Alcohol also directs blood flow to the surface of the skin which causes a decrease in the body's core temperature. That warm-all-over feeling is not warming your body, but cooling it instead. Alcohol has no place in plans for any outing.

It's a good idea also to refrain from smoking, especially in cold weather. Both alcohol and tobacco can increase your chances for frostbite at high altitudes or in cold temperatures.

SUMMARY

When the four priorities for sustaining life have been met, opportunities are open for enjoying other aspects of an outdoor experience. It is essential, however, that these basic principles first be met in order to provide a wholesome, enjoyable, and safe experience in the outdoors.

Lesson Plans

The following lesson plans are offered as a suggested and field-tested means of teaching this subject material. Activities provided have been taught by teachers, Department of Conservation education specialists and consultants, and youth leaders.

ADAPTABILITY TO THE DEVELOPMENTALLY DISABLED

Activities in this module should be suitable for all your students with few adaptations needed for those developmentally disabled. Possible problems that might be encountered in the outdoors for some students should be discussed. Questions to consider are: How does restricted movement, such as in a wheelchair or on crutches, affect the four basic needs? Are clothing needs different? What restrictions, if any, do wheelchairs or various disabilities present for outdoor activities?

No. 1

TITLE: Introduction, Historical Background, Ethics, The Priorities for Sustaining Life, The Priority of Air

METHOD: Lecture, class discussion, class exercise

TIME: 50 minutes

PURPOSE: To introduce the material; to give a historical background; to discuss the importance of learning the four priorities for sustaining life; to emphasize the importance of air.

INSTRUCTIONAL AIDS: None

FACILITIES: Classroom

OUTLINE:

LECTURE

I. Introduction
   - A. Outdoor recreational activities are gaining popularity--refer to chart of popular recreational activities. Ask students what outdoor activities they most enjoy--make list and determine most popular.
   - B. As Americans migrate to more urban areas they lose touch with a wilderness lifestyle. The back-to-nature enthusiasts may be ill-prepared to face wilderness settings.
   - C. Certain knowledge is necessary before going into the outdoors. Everyone planning an outdoor excursion should know the four priorities for sustaining life and how to adapt to various climatic changes. Missourians can face drastic temperature changes and experience both severe winters and hot, humid summers.

II. History
   - A. Ancestors attempted to civilize the wilderness.

B. Primitive wilderness gained new appeal as cities grew.

C. 1872--Yellowstone National Park established in Wyoming. Teddy Roosevelt led campaign for conservation in 1890s.

III. Ethics

A. We need to protect our natural resources so they will be available for future generations.

B. We should plan trips carefully to avoid accidents that may require rescue operations, which are dangerous and expensive.

IV. Four Priorities

A. Ask students to name what they think are the basic priorities needed to live. When they have named the four needed (air, shelter, water, food), have them rank each according to the most important or necessary. Compile their lists on the blackboard. (Many students will give food, the fourth priority, a much higher rank.) Discuss why they ranked the priorities as they did.

B. Now write the priorities in the proper order and discuss how long life will last, in most cases, without each:

air--3 minutes
shelter--3 hours (in extreme conditions)
water--3 days
food--3 weeks

V. Air

A. The first priority
In most cases death, or brain damage, occurs if air is denied for more than three to four minutes.

B. High altitude considerations

1. Acclimatization is important.
2. Allow time to gradually adjust--maintain slower pace and stop frequently to rest.
3. Watch for symptoms of nausea, shortness of breath, headache, "heavy legs," cramps.

CLASS EXERCISE

C. Exercise

1. Air is essential for life. Ask students to try to do without air for one minute. Using a clock or stopwatch to time, have students try to hold their breath for one minute; then try two minutes; then try three minutes.
2. Discuss why most could not hold their

breath for long, how it felt to not be able to breathe, what other feelings they experienced while holding their breath (dizziness, rapid heartbeat, etc.).

No. 8

TITLE: Priority of Shelter

METHOD: Lecture and class participation in exercises

TIME: Two 50-minute periods (allow more time if films are shown)

PURPOSE: To emphasize the importance of shelter and to demonstrate to students how body heat is lost and retained through radiation, convection, evaporation, respiration, and conduction.

INSTRUCTIONAL AIDS: See individual exercises. Two student handouts are available in Appendix 1 and 2. Three films are recommended: "By Nature's Rules" and "Cold Can Kill" (hypothermia situation) and "The Thermal Wilderness" (hyperthermia situation).

FACILITIES: Classroom

OUTLINE:

LECTURE

I. Introduction to Shelter
   - A. Shelter for the body begins with clothing--must dress appropriately for climatic conditions and natural area.
   - B. "Expect the best but prepare for the worst" is a good motto to live by in the outdoors.
   - C. Not controlling body temperature can result in
     1. Hyperthermia--increasing of the body's core temperature (a condition related to hot weather)
     2. Hypothermia--lowering of the body's core temperature (a condition related to cold weather--temperatures below 60°F/15°C)

II. Body Heat Loss or Retention
   - A. *Radiation*--The body gives off (radiates) heat, which needs to be kept close to the body by clothing.
     1. Up to 75 percent of body heat radiates from the head and neck. "When your feet get cold, put on your hat."
     2. Basic principles for clothing should be followed. See five principles covered in content material.
     3. How to wear layers of clothes can be shown with the following exercise.

CLASS EXERCISE

Materials needed: clothes as listed in exercise.
Reproduce and distribute "Minimum Outdoor Clothing Lists," Appendix 2.

a. Ask for a student volunteer or bring in a mannequin.
b. Apply layers of clothes in the following sequence to emphasize how to dress in winter to prevent heat loss from the body:
   1st layer: undergarments (swimsuit if using a student)
   2nd layer: shorts and T-shirt or long underwear
   3rd layer: 1 long-sleeved shirt
   wool pants
   1 pair wool socks
   wool hat, mittens or gloves, and scarf
   4th layer: wool sweater
   another pair of pants
   another pair of mittens
   5th layer: parka, jacket or windbreaker
   6th layer: rain suit or poncho
c. Discuss the purpose of each layer and how layers can be removed as a person generates more heat when exercising.

LECTURE

B. *Convection*--Air moving over the body draws away warm air and replaces it with cold air.
1. In cold weather, clothing should include an outer garment with a tight weave to provide wind protection (windbreaker).
2. In hot weather, clothing should have a loose weave to allow ventilation.
3. The cooling effects of wind can be demonstrated with the wet hand and wet clothing experiment.
   a. Ask for student volunteers. Have one student put his hand in the pan of water, take it out and wave it in the air. Ask student to report what he feels. He should sense an immediate cooling effect on his hand. Have other students try.
   b. Have two other students put on shirts (one cotton, one wool). Each student should submerge one sleeve of shirt in the pan of water and then stand in front of a blowing fan. Have the same students trade shirts. Ask them to report on the difference that wind makes in the temperature. How do wool and cotton differ?

CLASS EXERCISE

Materials needed: pan of water, cotton shirt, wool shirt, electric fan.
Reproduce and distribute "Wind Chill Chart," Appendix 1.

(Wool sheds a certain amount of water and possesses insulating properties to keep one warm even when wet.)

LECTURE

C. *Evaporation*--Body moisture (perspiration) must be allowed to evaporate.
   1. Clothing should be "breathable." Some modern-day materials provide both wind and water protection and still allow moisture to evaporate. Wool is good because it dries from the inside out.
   2. In cold weather, exercise should be kept below the point of perspiring or layers of clothing should be removed.
   3. What happens when material is not "breathable" can be shown with the plastic bag exercise.

CLASS EXERCISE

Materials needed: large plastic bags, tarps, or ponchos.

   a. Give members of the class plastic laundry bags, garbage bags, tarps, or ponchos. Have them wrap the materials around their legs or entire bodies.
   b. Have students exercise at different rates. They should notice the moisture and heat that builds up.
   c. Discuss what happens when moisture is trapped next to the skin and not allowed to evaporate as it was in the plastic. (Moisture next to the skin can cause chilling and even freeze and cause frostbite. In summer, moisture should be allowed to evaporate to cool the body.)

LECTURE

D. *Respiration*--When breathing, cold air is inhaled and warm air is exhaled.
   1. Air can be warmed by covering the mouth and nose with a wool scarf or cloth.
   2. The rebreather exercise is a good way to demonstrate how air can be warmed before it enters the body.

CLASS EXERCISE

Materials needed: cotton and wool handkerchiefs or pieces of cloth, plastic bag, thermometer.

   a. In winter (temperature should be below 40°F/4°C), take students outside and have them breathe cold air.
   b. Have them take turns breathing through both the cotton and the wool covering. Discuss how the air is warmed. Have

them notice how quickly the cotton material freezes.

c. If it isn't winter, this exercise can be done at home or at school by using a freezer or an ice locker.

d. Have students breathe into a plastic bag, then notice the buildup of moisture in the bag. This is warm air that is exhaled. Put a thermometer in the bag before and after the exercise to see if the temperature increases.

LECTURE

E. *Conduction* --Contact with cold surfaces draws or conducts heat away from the body (the colder the surface, the more heat that is lost).

1. Clothing that insulates helps reduce body heat from being lost.
2. Tarps, pads, cushions also help insulate the body from cold surfaces.
3. The insulating effect of certain materials can be shown by a class exercise that tests various materials.

CLASS EXERCISE

Materials needed: Bi-Therm thermometer (may be available from science department), block of wood, sheet of plastic, leaves in plastic bag, open-cell foam pad, closed-cell foam pad, air mattress, wool blanket.

a. This exercise works best in winter, although you can substitute a bucket or block of ice.

b. Have students sit on bare ground. They should take note of how quickly they become cold. Push thermometer into the ground and measure the ground temperature before and after a student sits.

c. Have students experiment with different insulating materials and discuss which are the most effective for keeping them from getting cold. Try different thicknesses of material. Discuss the usefulness of the different materials. Which ones will absorb water?

No. 3

TITLE: The Priority of Water

METHOD: Lecture, demonstration

TIME: 50 minutes

PURPOSE: To emphasize the importance of water and show students how to purify water.

INSTRUCTIONAL AIDS: Various means of purifying water (see class exercise)

FACILITIES: Classroom

OUTLINE:

LECTURE

I. Introduction to Water
   - A. The third priority is water. In most situations a person can live only three days without water.
   - B. It is possible to live longer. A boy survived for 11 days without water when he was trapped in rubble from an earthquake that hit Rumania. He was completely immobilized so his water expenditure was at an absolute minimum.
   - C. Much of the human body is water. Water is crucial to body functions.
     1. Male body composition--60-70 percent water.
     2. Female body composition--only about 50 percent water.
   - D. Control of water loss is critical in both hot and cold weather. It's important to maintain a balance when going outdoors.
     1. Under normal conditions, a person uses 2½ quarts per day.
        a. 2 quarts = excretion
        b. 1 pint = perspiration
        c. 1 pint = respiration
     2. Weather conditions and physical exertion can increase water loss.
   - E. Dehydration can be dangerous.
     1. Three percent loss can cause 25 percent decrease in efficiency and ability to make rational decisions.
     2. Ten percent water loss can cause death.
   - F. Minimize water loss by following five principles listed in content material.
   - G. On an outdoor excursion, carry enough water, purify water, or melt ice or snow (may also need to be purified).

II. Methods of Water Purification
   - A. Review methods of purifying water that are given in the content material.

1. Iodine
2. Chlorine Bleach
3. Water Purification Tablets
4. Boiling
5. Treatment Equipment

B. Have class perform various methods of purifying water.
   1. Divide the class into four groups. Give each group one quart of water. (Water may be obtained from a local pond or other source, but since some of the methods may not destroy all bacteria, tap water is recommended.)
   2. Stress the importance of following directions exactly. Have each group purify water with one of four methods--iodine, chlorine, tablets, and boiling.
   3. If you have access to a water purification filter, demonstrate how it is used by filtering each sample of water.
   4. Allow students to taste the water purified by the different methods. Discuss how the water tastes. Does the water with iodine and chlorine taste bad? Would adding flavored drinks help? Water that is boiled may taste flat. Have students pour the water that they have boiled back and forth into an empty jar; then taste the water to see if it tastes less flat.

CLASS EXERCISE

Materials needed: 2-percent tincture of iodine or iodine crystals (check with your local druggist), household bleach (such as Clorox *or* Purex*), water purification tablets, equipment for boiling water such as an electric pot, commercial water purifying unit (if available), five quart jars, thermometer. If iodine crystals are used, you will need a one ounce clear glass bottle.*

No. 4

TITLE: The Priority of Food

METHOD: Lecture, class exercise

TIME: 50 minutes

PURPOSE: To emphasize the importance of food and to have students compute how many calories they would need to maintain a caloric balance for a day of backpacking.

INSTRUCTIONAL AIDS: Chart listing calorie content of foods (optional)

FACILITIES: Classroom

OUTLINE:

LECTURE

I. Introduction to Food
   A. Food is the fourth priority because people can live three weeks or longer without food.

B. The energy food produces is needed when going outdoors.

C. Meal planning can be simple and lightweight food can be taken. Special planning is needed only for extended treks.

D. Different foods produce different amounts of energy. Calories used depends upon the amount of activity.

E. To achieve a "caloric balance," the calories consumed must equal the energy expended (basal metabolic rate plus physical activity).
   1. Basal rate (energy used to keep organs functioning and maintain body temperature) is affected by age, sex, size, and percentage of body fat.
   2. "Creeping obesity" occurs when people do not compensate for their decline in activity.

F. Foods are used differently by the body.
   1. One gram of fat produces nine calories of energy.
   2. One gram of carbohydrate produces four calories of energy.
   3. One gram of protein produces four calories of energy.
   4. Alcohol is ineffective and can be dangerous.
      a. It is a depressant.
      b. It dehydrates.
      c. It is a slow process to furnish energy because it must be converted to glucose by the liver.
      d. It decreases body temperature, which is particularly dangerous in winter.
      e. It can increase chances for frostbite.

II. Meal Planning

A. Meal planning for a strenuous trip should include fatty foods (margarine, nuts, peanut butter, vegetable oils), starches, and sweets. Vegetables such as celery, lettuce, and cabbage provide little energy.

CLASS EXERCISE

B. A good way to learn what is the best food to take is to compute the calories you will need for the activities planned.
   1. Give students the following information:

Activity	*Calories Needed*
BMR (basal metabolic rate) at 100 lbs (45 kg)	1100 a day
Walking at 3 mph on rough trails	180 an hour per 100 lbs (45 kg)--Add weight of pack if carrying backpack
Climbing	Body weight + pack weight × 110 calories for each elevation gain of 1000 ft (305 m)
Camp chores and regular activity	50 an hour per 100 lbs (45 kg)
Eating, sitting, writing, etc.	20 an hour per 100 lbs (45 kg)

2. Make up a problem such as the following:

How many calories would you need if you weighed 150 lbs (68 kg) to perform the following day's activities?

Length of Time	*Activity*	*Calories Needed*
	BMR for 150 lbs (68 kg)	(1100 × 1.5 = 1650)
7 to 8 a.m.	Get up, cook breakfast, clean up camp.	(50 × 1.5 = 75)
8 to 9 a.m.	Break camp, pack bags.	(50 × 1.5 = 75)
9 to 12 noon	Hike on flat, rough terrain with a 25 lb (11 kg) pack.	(180 × 1.75 × 3 hrs = 945)
12 noon to 1 p.m.	Eat lunch and rest.	(20 × 1.5 = 30)
1 to 5 p.m.	Hike to next campsite (rough terrain with pack).	(180 × 1.75 × 4 hrs = 1260)
5 to 6 p.m.	Catch and clean fish for dinner.	(50 × 1.5 = 75)
6 to 7 p.m.	Cook dinner and eat.	(20 × 1.5 = 30)
7 to 8 p.m.	Clean up and set up camp.	(50 × 1.5 = 75)
8 to 10 p.m.	Sit around campfire talking.	(20 × 1.5 × 2 hrs = 60)
10 p.m.	Bed.	(TOTAL = 4275)

3. Have students discuss what foods they would take to meet their caloric needs. Have them make up a day's menu using a chart of calories, or have them go to the store and select foods by computing calories from the information on the packages.

Related Activity

A Hidden Word Puzzle, which contains all 24 glossary words, is included in Appendix 3 and may be reproduced and distributed to students as a homework or extra credit assignment.

Glossary

ACCLIMATIZATION	The process of adapting to a new temperature, altitude, climate, environment, or situation.
BMR (Basal Metabolic Rate)	The energy required by the body, when at complete rest, to keep internal organs functioning and to maintain normal body temperature.
BREATHABILITY	A characteristic of clothing or material that allows body moisture, as water vapor,to escape.
CALORIC BALANCE	A condition achieved when energy input (calories consumed) equals energy expended (calories used through physical activity).
CALORIE	A measure of energy--the amount of energy in the form of heat required to raise the temperature of one gram of water one degree centigrade.
CONDUCTION	The process of conveying or transmitting, for instance, heat away from the body.
CONVECTION	The transfer of heat by a circulatory motion of air that draws heat away from the body. The air warmed by body heat is replaced with colder air.
CONSERVATION	Planned management of a natural resource to prevent exploitation, destruction, or neglect.
DEHYDRATION	An abnormal depletion of body fluids.
DOWN	Soft, fluffy feathers used as insulation in some materials.
EVAPORATION	The process of expelling moisture. It is the natural way the body cools itself. Moisture changes to a vapor or gas.
EXPOSURE	The condition of being deprived of shelter or protecti from natural elements such as wind, rain, sun, or snow.
HYPERTHERMIA	Increasing of the body's core temperature, a condition related to the effects of heat.
HYPOTHERMIA	Lowering of the body's core temperature, a condition related to the effects of cold.
LAYERING	A method of preventing heat loss in cold weather by applying several layers of clothes that insulate body heat and protect against wind and water chill.
LOFT	Thickness that retains air space and provides insulation in materials.
PRESERVATION	Protection from injury, harm, or destruction.
RADIATION	The process of emitting radiant energy (heat) in the form of waves or particles.

RESPIRATION	A single complete act of breathing (inhaling and exhaling).
WATERPROOF	Water cannot penetrate.
WATER-REPELLENT or WATER-RESISTANT	Resistant to water, but water may penetrate eventually.
WICKING	The process by which fabric will transfer moisture away from the surface of the skin.
WILDERNESS	An area with its naturally developed life community that is essentially undisturbed by human activity.

Bibliography

Keane, Dr. David D. "Thinsulate Thermal Insulation." *National Outdoor Outfitters News*, May 1978, pp. 12-15.

Lathrop, Theodore G., M.D. *Hypothermia: Killer of the Unprepared.* Portland, Oregon: Mazamas, Inc., 1975.

McCartan, C.B. "Son of Iodine, Out of Halazone." *Wilderness Camping*, December/January 1979, pp. 56-73.

Smith, Nathan J., M.D. *Food for Sport.* Palo Alto, California: Bull Publishing Co., 1976.

Appendix 1--Wind Chill Chart

WIND SPEED IN MPH	THERMOMETER READING, DEGREES FAHRENHEIT*								
	50	40	30	20	10	0	-10	-20	-30
calm	50	40	30	20	10	0	-10	-20	-30
5	48	37	27	16	6	-5	-15	-26	-36
10	40	28	16	4	-9	-21	-33	-46	-58
15	36	22	9	-5	-18	-36	-45	-58	-72
20	32	18	4	-10	-25	-39	-53	-67	-82
25	30	16	0	-15	-24	-44	-59	-74	-88
30	28	13	-2	-18	-33	-48	-63	-79	-94
35	27	11	-4	-20	-35	-49	-67	-82	-98
40	26	10	-6	-21	-37	-53	-69	-85	-100
	Little danger for properly clothed person.				Increasing danger that exposed flesh may freeze.			Great danger that exposed flesh may freeze.	

The wind chill chart is of value in predicting frostbite only to exposed flesh. To determine the wind chill, find the temperature and the wind speed on the chart. Where they intersect is the equivalent temperature with the wind. For example, a 30°F temperature with the wind blowing 25 mph is equivalent to a 0°F temperature.

*To convert Fahrenheit to Celsius, use the following formula: C° = 5/9(F°-32)

Appendix 8--Minimum Outdoor Clothing Lists

WINTER

1 wool hat or cap (balaclava style is most functional)
1 insulated jacket (polyester fill is most functional)
1 pair wind/rain parka and pants
1 wool shirt
2 wool sweaters (one thinner to be worn underneath)
1 pair wool trousers
2 pair cotton underwear
1 pair long underwear (wool is preferable)
1 pair thin wool gloves
1 pair wool mittens
1 pair nylon outer mittens
4 pairs of wool socks
1 pair of boots
1 belt or pair of suspenders

SPRING-SUMMER-FALL

1 hat with wide brim
1 lightweight shirt
1 wool shirt or sweater
1 pair of short pants or lightweight long pants
1 pair of wool pants
1 windbreaker
1 set of rain gear
2 changes of underwear
2 pairs of wool socks
1 pair of gloves or mittens
1 swimsuit
1 handkerchief
1 pair of sturdy shoes or boots (avoid leather soles)
1 belt or pair of suspenders

Appendix 5--Hidden Word Puzzle

Find the 24 vocabulary words (listed at left) that are contained in this puzzle. The words are vertical, horizontal, diagonal, forward, and backward, and some of them overlap. Do you know what the words mean?

ACCLIMATIZATION

BMR

BREATHABILITY

CALORIC BALANCE

CALORIE

CONDUCTION

CONSERVATION

CONVECTION

DEHYDRATION

DOWN

EVAPORATION

EXPOSURE

HYPERTHERMIA

HYPOTHERMIA

LAYERING

LOFT

PRESERVATION

RADIATION

RESPIRATION

WATERPROOF

WATER-REPELLENT

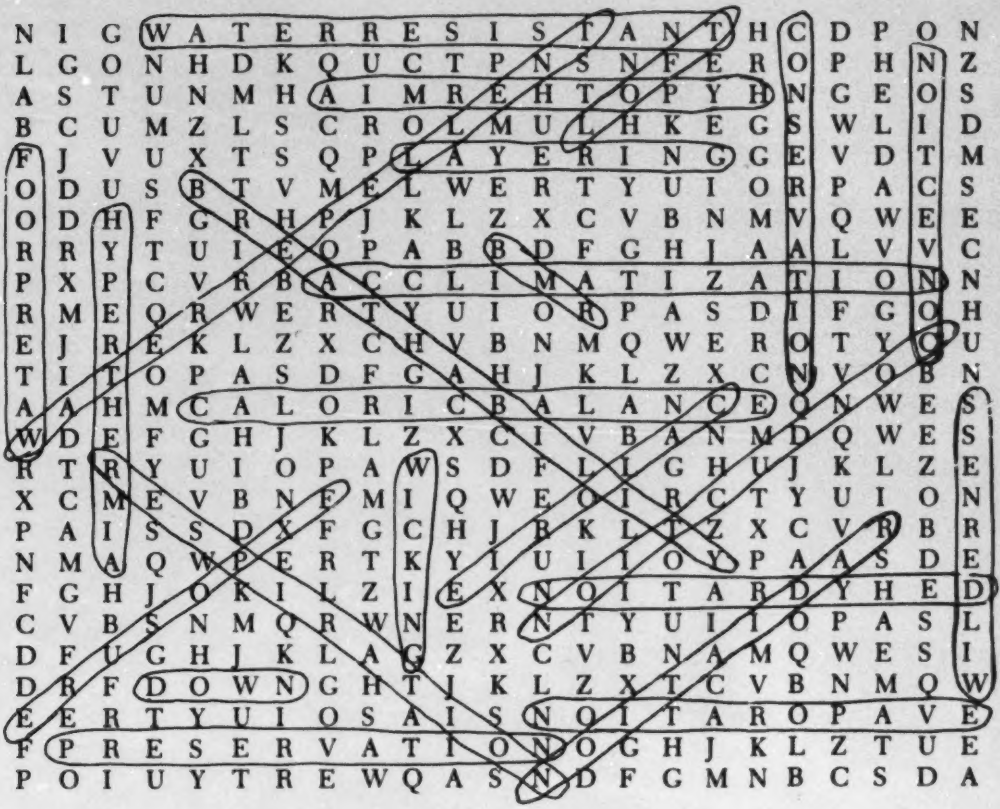
WATER-RESISTANT

WICKING

WILDERNESS

N	I	G	W	A	T	E	R	R	E	S	I	S	T	A	N	T	H	C	D	P	O	N
L	G	O	N	H	D	K	Q	U	C	T	P	N	S	N	F	E	R	O	P	H	N	Z
A	S	T	U	N	M	H	A	I	M	R	E	H	T	O	P	Y	H	N	G	E	O	S
B	C	U	M	Z	L	S	C	R	O	L	M	U	L	H	K	E	G	S	W	L	I	D
F	J	V	U	X	T	S	Q	P	L	A	Y	E	R	I	N	G	G	E	V	D	T	M
O	D	U	S	B	T	V	M	E	L	W	E	R	T	Y	U	I	O	R	P	A	C	S
O	D	H	F	G	R	H	P	J	K	L	Z	X	C	V	B	N	M	V	Q	W	E	E
R	R	Y	T	U	I	E	O	P	A	B	B	D	F	G	H	J	A	A	L	V	V	C
P	X	P	C	V	R	B	A	C	C	L	I	M	A	T	I	Z	A	T	I	O	N	N
R	M	E	Q	R	W	E	R	T	Y	U	I	O	R	P	A	S	D	I	F	G	O	H
E	J	R	E	K	L	Z	X	C	H	V	B	N	M	Q	W	E	R	O	T	Y	C	U
T	I	T	O	P	A	S	D	F	G	A	H	J	K	L	Z	X	C	N	V	O	B	N
A	A	H	M	C	A	L	O	R	I	C	B	A	L	A	N	C	E	Q	N	W	E	S
W	D	E	F	G	H	J	K	L	Z	X	C	I	V	B	A	N	M	D	Q	W	E	S
R	T	R	Y	U	I	O	P	A	W	S	D	F	L	L	G	H	U	J	K	L	Z	E
X	C	M	E	V	B	N	E	M	I	Q	W	E	O	I	R	C	T	Y	U	I	O	N
P	A	I	S	S	D	X	F	G	C	H	J	R	K	L	T	Z	X	C	V	R	B	R
N	M	A	Q	W	P	E	R	T	K	Y	I	U	I	I	O	Y	P	A	A	S	D	E
F	G	H	J	O	K	I	L	Z	I	E	X	N	O	I	T	A	R	D	Y	H	E	D
C	V	B	S	N	M	Q	R	W	N	E	R	N	T	Y	U	I	I	O	P	A	S	L
D	F	U	G	H	J	K	L	A	G	Z	X	C	V	B	N	A	M	Q	W	E	S	I
D	R	F	D	O	W	N	G	H	T	J	K	L	Z	X	T	C	V	B	N	M	Q	W
E	E	R	T	Y	U	I	O	S	A	I	S	N	O	I	T	A	R	O	P	A	V	E
F	P	R	E	S	E	R	V	A	T	I	O	N	O	G	H	J	K	L	Z	T	U	E
P	O	I	U	Y	T	R	E	W	Q	A	S	N	D	F	G	M	N	B	C	S	D	A

Instructor's Key to Hidden Word Puzzle


N I G W A T E R R E S I S T A N T H C D P O N
L G O N H D K Q U C T P N S N F E R O P H N Z
A S T U N M H A I M R E H T O P Y H N G E O S
B C U M Z L S C R O L M U L H K E G S W L I D
F J V U X T S Q P L A Y E R I N G G E V D T M
O D U S B T V M E L W E R T Y U I O R P A C S
O D H F G R H P J K L Z X C V B N M V Q W E E
R R Y T U I E O P A B B D F G H J A A L V V C
P X P C V R B A C C L I M A T I Z A T I O N N
R M E O R W E R T Y U I O R P A S D I F G O H
E J R E K L Z X C H V B N M Q W E R O T Y O U
T I T O P A S D F G A H J K L Z X C N V O B N
A A H M C A L O R I C B A L A N C E Q N W E S
W D E F G H J K L Z X C I V B A N M D Q W E S
R T R Y U I O P A W S D F L I G H U J K L Z E
X C M E V B N E M I Q W E C I R C T Y U I O N
P A I S S D X F G C H J B K L I Z X C V R B R
N M A Q W P E R T K Y I U I I O Y P A A S D E
F G H J O K I L Z I E X N O I T A R D Y H E D
C V B S N M Q R W N E R N T Y U I I O P A S L
D F U G H J K L A G Z X C V B N A M Q W E S I
D R F D O W N G H T J K L Z X T C V B N M Q W
E E R T Y U I O S A I S N O I T A R O P A V E
F P R E S E R V A T I O N O G H J K L Z T U E
P O I U Y T R E W Q A S N D F G M N B C S D A

Prepared by Claudia Hunter

Appendix 4--Suggested Written Examination

ANSWERS

1. *Air--3 minutes*
   Shelter--3 hours
   (in extreme conditions)
   Water--3 days
   Food--3 weeks
2. *Radiation, Convection, Evaporation, Respiration, Conduction--see pages 13-15.*
3. *See page 13.*
4. *c. Wool continues to insulate body heat even when it is wet.*
5. *Iodine, Chlorine Bleach, Water Purification Tablets, Boiling, Treatment Equipment--see pages 16-17.*
   Treating water with iodine and then filtering it through a water-purifying unit is recommended as the safest method.
6. *b.*
7. *Peanut butter, Nuts, Margarine, Candy bars, Protein breakfast bars, Cupcakes, Chocolate--see pages 18-19.*
8. *BMR is the energy required by the body, when it is at complete rest, to keep internal organs functioning and to maintain body temperature. Caloric balance is achieved when the calories consumed = BMR + energy expended in physical activity.*
9. *Alcohol is a depressant, dehydrates the body, is a slow process to furnish energy because it must be converted to glucose by the liver, decreases body temperature, and can increase chances for frostbite.*
10. *See pages 12-19.*

QUESTIONS

The following questions are suggested as a written evaluation for the Basic Principles module. Questions are keyed to the objectives listed on page 10.

1. List, in the correct order, the four priorities for sustaining life and give the time it might take for death to occur if the priority were denied.

2. List the five physical processes by which body heat is lost or retained. Describe what happens with each process.

3. Describe the layering principle of dressing for outdoor activities. What six layers of clothes should be worn if you are participating in an outdoor activity in winter?

4. The most satisfactory fabric for outdoor clothing is:

   a. cotton
   b. nylon
   c. wool
   d. plastic

   Give one reason why the fabric you picked is the best.

5. List and describe two methods of purifying water for drinking. What is the method recommended as the safest?

6. Which of the following produce the greatest number of calories of energy?

   a. proteins
   b. fats
   c. carbohydrates

7. Name five foods that would be considered high energy foods.

8. What is basal metabolic rate? What part does it play in maintaining a caloric balance?

9. List three reasons why alcohol is not an efficient source of energy, and even can be dangerous, if consumed when in the outdoors.

10. Write a short essay discussing what preparations you would make for an overnight winter camping trip in Missouri. Give at least one reason why each is necessary.

Specialists' Regions

Northwest Area
Louis F. Diebold
P.O. Box 26
Savannah, MO 64485
816/324-4672

Northeast Area
Wayne Martin
1710 E. McPherson
Kirksville, MO 63501
816/665-8075

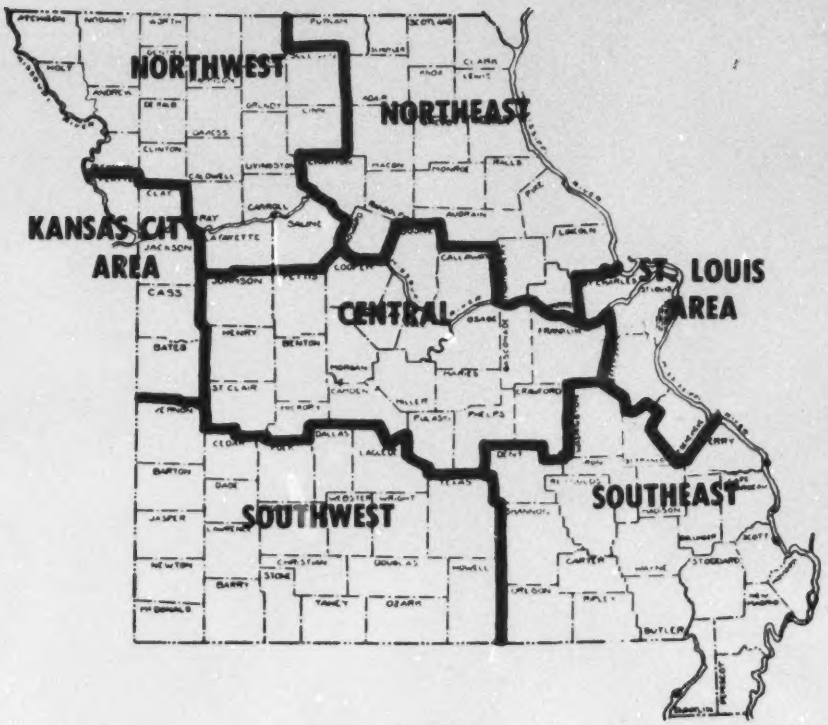
St. Louis Area
William D. Rice
5691 Freiling
Kinloch, MO 63140
314/521-8560

Southeast Area
Stephen J. Wilson
1310 W. Cape Rock Dr., #66
Cape Girardeau, MO 63701
314/335-8843

Southwest Area
Richard Flint
214 West Pleasant
Aurora, MO 65605
417/678-2445

Kansas City Area
Betty A. Loggins
6445 E. 127 Street
Grandview, MO 64030
816/765-5738

Central Area
Robert D. Staton, Jr.
303B North High Street
California, MO 65018
314/796-2669



Consultants' Regions

District 1
Rodney J. Green
408 South Polk
Albany, MO 64402
816/726-3677

District 2
Hollis D. Crawford
Route 1, Box 21
Gibbs, MO 63540
816/332-7278

District 3
Neil W. Jenkins
Route 3, Box 64
Lee's Summit, MO 64063
816/524-6196

District 4
Charles D. Jordan
620 Hillcrest Drive
Knob Noster, MO 65336
816/563-3738

District 5
Wendell Jeffery
Route 5, Box 23
Eldon, MO 65026
314/392-3217

District 6
Al Palladino
Virginia Village; Apt. 203-B3
Warrenton, MO 63383
314/456-4208

District 7
Harold W. Thiele
7414 Dalgren
St. Louis, MO 63123
314/842-3870

District 8
Jack C. Woodhead
326 Cerny
Eureka, MO 63025
314/587-2076

District 9
Ross Allen
P.O. Box 3945
Glenstone Station
Springfield, MO 65804
417/881-6698

District 10
Virgil L. Davis
803 Summerfield
Houston, MO 65483
417/967-2123

District 11
Gordon S. Griffin
806 Sherman Avenue
Charleston, MO 63834
314/683-6940

District 13
David B. Knisley
1409 San Miguel Lane
Fenton, MO 63026
314/225-3198

District 14
Larry Behrens
407 East Walnut
Shelbina, MO 63468
314/588-4252

District 15
Jim Pyland
Route 2, Box 64D
Kearney, MO 64060
816/676-3855